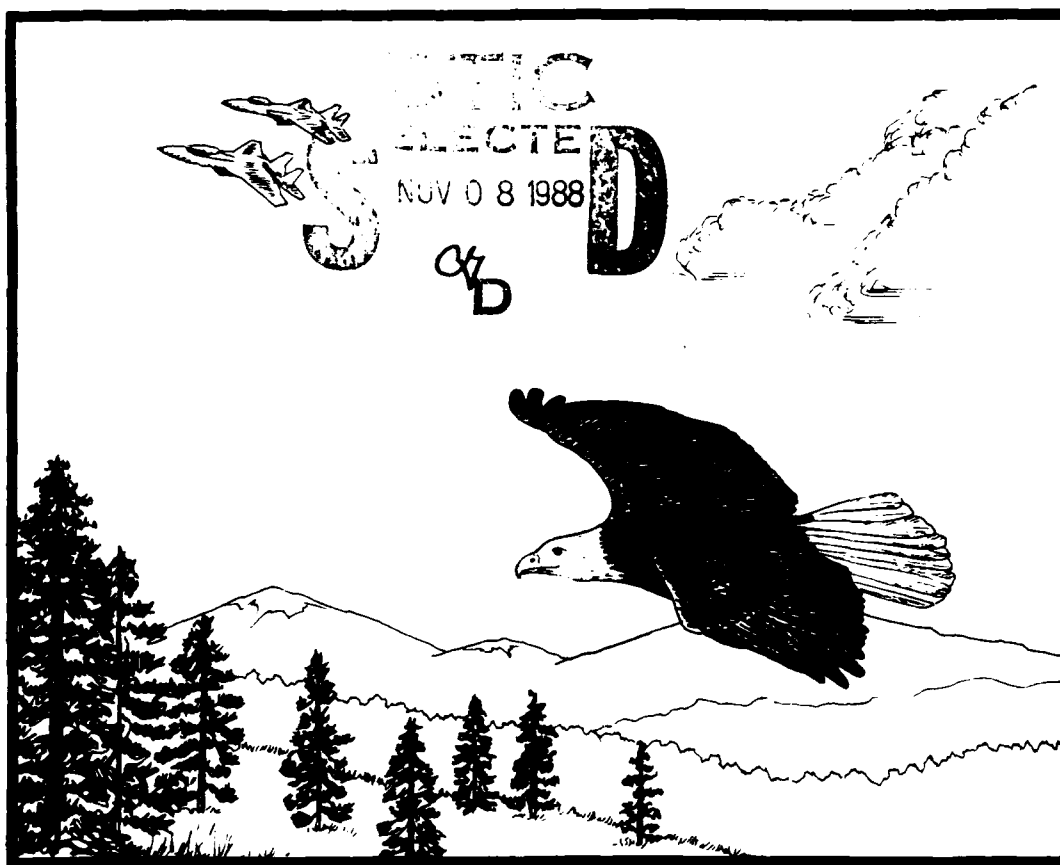


NERC 88/30
JUNE 1988

**EFFECTS OF AIRCRAFT NOISE
AND SONIC BOOMS ON
FISH AND WILDLIFE:
RESULTS OF A SURVEY OF U.S. FISH
AND WILDLIFE SERVICE ENDANGERED
SPECIES AND ECOLOGICAL SERVICES
FIELD OFFICES, REFUGES, HATCHERIES,
AND RESEARCH CENTERS**



Fish and Wildlife Service

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U.S. FISH AND WILDLIFE SERVICE
ENDANGERED SPECIES AND ECOLOGICAL SERVICES
FIELD OFFICES, REFUGES, HATCHERIES,
AND RESEARCH CENTERS

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PREFACE

This report was produced as the result of a cooperative research project between the National Ecology Research Center, Ft. Collins, Colorado and the Air Force Engineering and Services Center, Tyndall Air Force Base, Florida, on the effects of aircraft noise and sonic boom on animals. The effort was funded by the Air Force's Noise and Sonic Boom Impact Technology program, Wright-Patterson Air Force Base, Ohio.

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INTRODUCTION

The National Ecology Research Center (Center), as part of an ongoing research study on the effects of low-altitude aircraft operations on fish and wildlife, conducted a survey in January 1987 of all U.S. Fish and Wildlife Service (Service) regional directors, research center directors, Ecological Services and Endangered Species field offices supervisors, refuge managers, and hatchery managers. The objective of the survey was to determine the nature and extent of aircraft-induced impacts on fish and wildlife species, populations, and habitat utilization.

Because many Service field installations are located near military and civilian airports and flight training areas, the results of the survey could be useful to Service personnel who must comment on proposed flight operations and for evaluating habitat in such areas. The field installation managers and biologists were asked to provide background information or data on fish and wildlife reactions to low-altitude aircraft disturbances, including physiological, behavioral, and reproductive/population effects. The survey stressed that because of the current lack of information on the effects of aircraft on fish and wildlife, any type of information the respondent could supply would be of interest.

Specifically, the survey asked for information such as:

- (1) observations of animal reaction(s) to aircraft operations, e.g., desert bighorn sheep scare behavior in response to aircraft overflights or hatchery fish seizures and death following intense sonic booms;
- (2) instances of areas where aircraft noise is known or believed to be responsible for reduced population size, e.g., areas along heavily used aircraft flight corridors where breeding waterfowl densities are lower than in similar habitat away from the noise area (Shaw);
- (3) descriptions of areas or sites where adequate background data on wildlife habitat and populations are available to compare impacted and nonimpacted sites;
- (4) any other data or information that might be relevant or helpful in determining the direction and design of future aircraft impact studies; and
- (5) expression of the importance of aircraft/wildlife impact information to the Service.

The 132 responses varied from no known adverse aircraft-induced effects on a given refuge or hatchery, to waterfowl leaving an area due to the presence of low-altitude aircraft overflights, to the death of fish at a hatchery due to intense sonic booms.

Survey responses that contained information on the effects of aircraft on fish and wildlife were entered into a data base (Table 1 and Appendix 1), using the QUICKTEXT data base management system (Osborn and Strong 1984). QUICKTEXT is a user-friendly data management system that permits easy selection of keywords in fields to sort, list, and summarize responses by region, State, year, agency, location, type of aircraft, animal group, and problem/issue descriptors.

DATA BASE SUMMARY

Multiple responses from separate personnel came from Aransas National Wildlife Refuge (NWR) (6 responses), Bombay Hook NWR (2), Sacramento NWR (2), and Wichita Mountains NWR (2). Approximately 24% of the responding installations were in Region 1, 23% in Region 2, 20% in Region 4, and less than 10% each in the other Service regions. The data base contains information received from installations in 30 States. The States with the highest number of installations reporting aircraft disturbance were Texas (11 installations), California (6), Nevada (5), Alaska (4), and North Carolina (4).

Table 1. Aircraft/wildlife impacts data base fields.

Field no.	Fieldname	Description
1	ITEM#	Assigned by QUICKTEXT.
2	REGION	Service region of installation.
3	STATE	State of installation.
4	YEAR	Year of response.
5	AGENCY	Government agency responding to survey (at present, data base only contains Service code).
6	LOCATION	Name of installation.
7	AIRCRAFT	Type of aircraft causing disturbance (e.g., MILITARY, COMMERCIAL, HELICOPTER, SMALL JET).
8	ANIMAL	Animal group(s) being disturbed (e.g., BIRDS, WATERFOWL, UNGULATES).
9	ISSUE	Short description of problem(s)/ issue(s).

Aircraft causing disturbances at the installations were classified as military (60% of the installations), private (44%), and commercial (37%). Helicopters caused disturbance at 70% of the installations, small jets at 59%, small propeller aircraft at 50%, and large jets at 31%.

Installations reported a variety of birds, mammals, and fish disturbed by aircraft operations (Table 2).

Table 2. Animal groups reported by installations as being potentially affected by low-altitude aircraft operations.

Animal group	Installations reporting	
	Number	Percent
<u>Birds</u>	63	90
Waterfowl	44	63
Raptors	12	17
Shorebirds	8	11
Colonial nesting	7	10
Upland game	6	9
Waterbirds (e.g., cranes)	3	4
Seabirds	3	4
Cavity-nesting	1	1
Passerines	1	1
Other (unspecified)	7	10
<u>Mammals</u>	14	20
Ungulates	12	17
Marine mammals	1	1
Bats	1	1
<u>Fish</u>	5	7

DISCUSSION

The problem of aircraft disturbance to fish and wildlife exists over a wide geographic area. Various types of military, commercial, and private aircraft have been responsible for disturbing wildlife on and near Service installations. Several reports stated that helicopters appear to cause a greater flight/fright response in wildlife than fixed-wing aircraft. Waterfowl were by far the most frequently reported animal group disturbed by aircraft. Several installations reported that some species of waterfowl were completely driven off refuges by frequent aircraft activity (e.g., Texas Point NWR). Waterfowl are an extremely visible group of birds, and the incidence of reports of disturbance may be a reflection of this as well as the apparent greater sensitivity of the group to aircraft disturbance. Clearly, additional research is needed to determine if more secretive, less conspicuous bird species also are being adversely affected by aircraft.

The reported impacts on wildlife range from minor behavioral responses to severe changes in the use of an area (e.g., Texas Point NWR). Information on the relationship of the observed reactions to physiologic, population, and reproductive effects for most species and situations is currently unknown.

Several installations reported extreme aircraft disturbance to colonial nesting species. For example, the only United States colony of magnificent frigatebirds (Fregata magnificens) may be declining due to frequent low-altitude overflights by tour planes at Key West NWR. In addition, low-altitude military overflights are believed to be causing the endangered palila bird (Psittirostra bailleui) of Hawaii to underutilize a sizable portion of its critical habitat.

Several installations reported that low-altitude aircraft have caused ungulates to stampede [e.g., desert bighorn sheep (Ovis canadensis nelsoni) at Desert NWR and pronghorn (Antilocapra americana) at Hart Mountain NWR and Sheldon NWR]. Concern was expressed for potential adverse effects of low-altitude aircraft over fawning/calving grounds [e.g., endangered Sonoran pronghorn antelope (Antilocapra americana sonoriensis) at Cabeza Prieta NWR and barren ground caribou (Rangifer tarandus) at Selawik NWR].

Service refuges and Ecological Services and Endangered Species field offices currently lack an adequate knowledge base on the effects of low-altitude aircraft on fish and wildlife, and are consequently making assessments of the potential effects of proposed flight areas based on inadequate information. Field installation managers expressed a high level of frustration at their helplessness to stop or modify proposed projects that would increase the level of aircraft disturbance at or near their installations. Virtually all field installations responding to the survey expressed support for further research on the effects of aircraft noise and sonic booms on fish and wildlife. At this point, the number of other Service field installations that have aircraft problems, but failed to respond to the survey, is unknown.

RECOMMENDATIONS

The following recommendations are made based on the survey results.

1. A formal mechanism should be established for refuges by which the majority of airspace intrusions and resultant animal responses can be documented. Violations of the Federal Aviation Administration's (FAA) recommended 2,000 ft minimum flight altitude above ground level needs to be reported to the FAA for private and commercial aircraft, and to the military base of origin for military aircraft. Photographing the intruding aircraft may be necessary to document approximate height above ground level and to identify the aircraft for reporting purposes. Ideally, the sound level should be recorded using sound level meters, and animal responses should be quantified to the extent possible. For example, a report should contain information similar to the following: "A single pass over a refuge by a military aircraft bearing the letter designation HL (Hill Air Force Base, Utah) at approximately 200 ft above ground level at 1 p.m. on 2 July 1987 created a peak noise level of 105 decibels and caused virtually all refuge waterfowl to leave the area for approximately 2 hours." The documented complaint should be reported to the appropriate Commanding Officer at the base causing the violation and to the FAA. Some Service refuges are currently employing such a reporting system.
2. Because many of the Service field installations responding to the survey reported a lack of sufficient information on aircraft impacts when called upon to comment on proposed flight operations, all Service refuges and Ecological Services and Endangered Species field offices should be provided with a copy of the joint Center/Air Force publication entitled "Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife."
3. A central clearinghouse for aircraft/wildlife impacts information should be established.
4. A follow-up study to this preliminary survey should be conducted to gather additional information from Service field installations. The results should be analyzed and summarized in a report similar to, but more detailed than, this one.
5. Service field installations should develop better working relations with airport operators, the FAA, and military bases regarding the effects of aircraft operations, both ongoing and proposed, on fish and wildlife.

6. Formal field research on the effects of low-altitude aircraft operations on fish and wildlife, with emphasis on waterfowl, colonial nesting birds, and threatened and endangered species should be conducted. This research should be conducted to translate observed behavioral responses to low-altitude aircraft overflights to potential adverse reproductive/population effects. Studies should be conducted that compare the wildlife use and productivity of infrequently overflowed refuges to those frequently overflowed by low-altitude aircraft, but otherwise similar in location and resource availability.
7. An aircraft impact prediction capability should be defined and developed, and access to the capability should be made available to all Service field installations.

LITERATURE CITED

Osborn, R.G., and P. Strong. 1984. SAGIS QUICKTEXT user manual. U.S. Fish Wildl. Serv., National Ecology Research Center, Fort Collins, CO. 80 pp.

Appendix I. Survey results by FWS region.

Item #	Region	State	Year	Agency/Location	Aircraft	Animal	Issue
1	1	CA	1987	USFWS/Ridgefield NWR	Private/small propeller/helicopter	Birds/waterfowl	Frequent overflights cause flushing of waterfowl, especially snow geese. The 2,000 ft above ground level minimum altitude for refuges is frequently violated.
2	1	CA	1987	USFWS/Sacramento ES Office	Military/commercial/private/small propeller/small jet/helicopter	Birds/waterfowl/shorebirds/other	Cited the FWS need for an impact prediction capability for proposed low-altitude aircraft operations.
3	1	CA	1986	USFWS/Sacramento NWR (2)	Military/private/small propeller/small jet/helicopter	Birds/waterfowl	Frequent overflights are causing serious disturbance to Refuge waterfowl, especially geese. Helicopters are more disruptive than wing aircraft. Aircraft-induced stress is believed to be making waterfowl more susceptible to disease.
4	1	CA	1987	USFWS/Sacramento SE Office	Military/commercial/private/small propeller/small jet/helicopter	Birds/waterfowl/shorebirds/other	Cited the FWS need for an impact prediction capability for proposed low-altitude aircraft operations.
5	1	CA	1987	USFWS/San Luis NWR Complex	Commercial	Birds/waterfowl	Numerous agricultural spray plane operations near the Refuge Complex are flushing waterfowl, especially geese, and are sometimes driving the animals off the Refuge. Aircraft-induced stress is believed to be making waterfowl more susceptible to disease, especially during winter.
6	1	HI	1987	USFWS/Pacific Islands SE Area Office	Military/small jet/helicopter	Birds/waterfowl/raptors/passerines/mammals/bats	The Area Office initiated a formal Section 7 consultation for a proposed USAF low-altitude route in Hawaii. It is believed the route could have an adverse effect on endangered species, including the Hawaiian hawk, Hawaiian goose, and Hawaiian hoary bat, as well as several species of passerine forest birds.

Appendix I. (Continued)

Item #	Region	State	Year	Agency/Location	Aircraft	Animal	Issue
7	1	NV	1987	USFWS/Anaho Island NWR	Military/small jet/large jet/helicopter	Birds/colonial nesting	Infrequent low-altitude aircraft operations are flushing pelicans.
8	1	NV	1987	USFWS/Desert NWR	Military/small jet/large jet/helicopter	Mammals/ungulates	A possible impact to desert bighorn sheep is suspected due to a declining population and extensive and intensive aircraft operations.
9	1	NV	1987	USFWS/Fallon NWR	Military/small jet/large jet/helicopter	Birds/waterfowl/shorebirds/other	Frequent low-altitude aircraft operations are constantly disturbing (flushing) waterfowl, shorebirds, and other Refuge birds.
10	1	NV	1987	USFWS/Lahontan NFH	Military/small propeller	Fish	An experiment done in cooperation with the U.S. Air Force showed that a mild sonic boom had no effect on fish eggs.
11	1	NV	1987	USFWS/Stillwater NWR	Military/small jet/large jet/helicopter	Birds/waterfowl/shorebirds/other	Frequent low-altitude aircraft operations are constantly flushing waterfowl, shorebirds, and other Refuge birds.
12	1	OR	1987	USFWS/Hart Mountain NWR	Military/small jet/helicopter	Mammals/ungulates	Antelope are exhibiting panic running behavior as the result of low-altitude jet fighter aircraft.
13	1	OR	1987	USFWS/Malheur NWR	Military/small jet/large jet/helicopter	Mammals/ungulates/birds/waterfowl	Malheur NWR is now on the fringe of a new Military Operations Area and it is feared that low-altitude aircraft operations may displace Refuge wildlife.
14	1	OR	1987	USFWS/Sheldon NWR	Military/small jet/helicopter	Mammals/ungulates	Antelope are exhibiting panic running behavior as a result of overpasses by low-altitude jet fighter aircraft.

Appendix I. (Continued)

Item #	Region	State	Year	Agency/Location	Aircraft	Animal	Issue
15	1	WA	1987	USFWS/Conboy Lake NWR	Military/helicopter	Birds/waterfowl	Virtually all Refuge ducks, geese, and swans will take flight at the sound of approaching helicopters and remain airborne until the aircraft can no longer be heard. A formal written complaint has been made to the Military.
16	1	WA	1987	USFWS/Washington Islands NWR	Military/private/ small propeller/ small jet/ helicopter	Birds/waterfowl/ shorebirds/ raptors/ seabirds/ mammals/marine mammals	Frequent overflights are causing flushing of birds and stampeding of marine mammals. Identifiable aircraft numbers were turned over to law enforcement with no results.
17	1	WA	1987	USFWS/Willapa NWR	Military/private/ small propeller/ small jet/ helicopter	Birds/waterfowl	Frequent overflights, even as high as 3,000-4,000 ft above ground level cause brant to panic flush and leave the area for hours, sometimes missing the next low-tide feeding opportunity.
18	2	AZ	1987	USFWS/Cabeza Prieta NWR	Military/small jet	Mammals/ ungulates/birds/ upland game	Reactions to intense sonic booms vary from alert and startle in bighorn sheep, jumping and running in the endangered Sonoran pronghorn, and frequent flushing by birds (including Gambel's quail, mourning doves, and white-winged doves). Most wildlife of the Refuge appear to have habituated to the repetitive sights and sounds of low-altitude aircraft flights that have taken place in the area over the past 40 years. The Refuge is concerned about intense aircraft operations over lambing grounds of the Sonoran pronghorn. The effect of flights on population sizes and altered behavior of Refuge wildlife should be investigated.

Appendix I. (Continued)

Item #	Region	State	Year	Agency/Location	Aircraft	Animal	Issue
19	2	AZ	1987	USFWS/Phoenix ES Office	Private/small propeller	Birds/raptors	Overflights by small propeller aircraft and helicopters had no adverse effect on breeding bald eagles in a 4-year study.
20	2	AZ	1987	USFWS/Willow Beach NFH	Military/commercial/private/small propeller/small jet/helicopter	Mammals/ungulates/fish	Aircraft noise and sonic booms are having no effect on fish at the hatchery. It is suspected that aircraft are having an adverse effect on desert bighorn sheep, especially at calving time.
21	2	NM	1987	USFWS/Bosque del Apache NWR	Private/small propeller	Birds/waterfowl/waterbirds	Infrequent overflights are creating "scare" behavior in waterfowl, sandhill cranes, and whooping cranes.
22	2	OK	1987	USFWS/Wichita NWR	Military/private/small propeller/small jet/helicopter	Birds/waterfowl	Waterfowl will flush and remain airborne for varying lengths of time when low-altitude aircraft are over the Refuge.
23	2	OK	1987	USFWS/Wichita Mountains NWR (2)	Military/private/small propeller/small jet/helicopter	Mammals/ungulates/birds/waterfowl	Refuge animals are being startled by aircraft and are exhibiting alert behavior. Waterfowl will flush and remain airborne for varying lengths of time when low-altitude aircraft are in the vicinity. Buffalo, longhorn cattle, deer, and elk have apparently habituated to the aircraft. It was stated that the most serious impact is on the people visiting the Refuge whose experiences are damaged by frequent overflights.
24	2	TX	1987	USFWS/Anahuac NWR	Commercial/helicopter	Birds/waterfowl	Frequent low-altitude overflights by commercial helicopters involved in oil and gas activities are causing waterfowl to flush and leave the Refuge until the noise level returns to ambient.

Appendix I. (Continued)

Item #	Region	State	Year	Agency/Location	Aircraft	Animal	Issue
25	2	TX	1987	USFWS/Aransas NWR (6)	Commercial/ private/small propeller/ helicopter	Birds/waterbirds/ waterfowl/ raptors/colonial nesting/mammals/ ungulates	It is believed that whooping cranes have habituated to low-altitude light aircraft overflights during the last 30 years. Sandhill cranes will flush at the approach of light aircraft and have apparently not habituated. Whooping cranes are flushing at the approach of low-altitude helicopters and remaining away from the Refuge until the noise level returns to ambient. A response threshold has been determined to be 500 ft minimum above ground level but the threshold is frequently violated by aircraft. Sandhill cranes, egrets, herons, raptors, and other Refuge birds, and deer are also exhibiting flight/fright behavior at the approach of helicopters. Frequent low-altitude overflights by commercial helicopters involved in oil and gas activities are causing waterfowl to flush and leave the Refuge until the noise level returns to ambient.
26	2	TX	1987	USFWS/Attwater's Prairie Chicken NWR	Military/ commercial/ private/small propeller/small jet/large jet/ helicopter	Birds/upland game	A study on the effects of low-altitude aircraft on Attwater's prairie chickens showed no adverse impact.
27	2	TX	1987	USFWS/Brazoria NWR	Commercial/ helicopter	Birds/waterfowl	Frequent low-altitude overflights by commercial helicopters involved in oil and gas activities are causing waterfowl to flush and leave the Refuge until the noise level returns to ambient.

Appendix I. (Continued)

Item #	Region	State	Year	Agency/Location	Aircraft	Animal	Issue
28	2	TX	1987	USFWS/Corpus Christi ES Field Office	Military/private/ small propeller/ small jet/ helicopter	Birds/colonial nesting	Low-altitude overflights flush breeding birds (part- icularly brown pelicans) and can cause panic reactions that result in lost eggs and young. Repeated flushing can cause abandonment of the rookery. Private aircraft over the rookery has been a considerable management problem because ownership of the planes cannot easily be identified. The military have been cooperative when contacted about flights disturbing rookeries.
29	2	TX	1987	USFWS/Laguna Atascosa NWR	Commercial/ helicopter	Birds/waterfowl	Frequent low-altitude overflights by commercial helicopters involved in oil and gas activities are causing waterfowl to flush and leave the Refuge until the noise level returns to ambient.
30	2	TX	1987	USFWS/McFadden NWR	Commercial/ helicopter	Birds/waterfowl	Frequent low-altitude overflights by commercial helicopters involved in oil and gas activities are causing waterfowl to flush and leave the Refuge until the noise level returns to ambient.
31	2	TX	1987	USFWS/San Bernard NWR	Commercial/ helicopter	Birds/waterfowl	Frequent low-altitude over- flights by commercial helicopters involved in oil and gas activities are causing waterfowl to flush and leave the Refuge until the noise level returns to ambient.
32	2	TX	1987	USFWS/Texas Point NWR	Commercial/ helicopter	Birds/waterfowl	The high frequency of low- altitude helicopters are causing severe impacts on waterfowl. The Refuge is virtually unused by water- fowl, particularly snow geese.

Appendix I. (Continued)

Item #	Region	State	Year	Agency/Location	Aircraft	Animal	Issue
33	3	IL	1987	USFWS/Mark Twain NWR	Commercial/private/ small propeller/ small jet/large jet	Birds/waterfowl/ raptors/upland game	Geese on banding sites "spook" at merely hearing a small plane in the distance. Geese seem to raise their heads before a person can hear the noise. Red-tailed hawks, American kestrels, prairie chickens, and resident giant Canada geese near commercial airports appear to readily adjust to airport noise.
34	3	IN	1987	USFWS/Bloomington ES Office	Military/helicopter	Birds/colonial nesting	The Field Office commented on a proposed Air National Guard operation that would involve helicopters flying in close proximity to great blue heron rookeries. The Office stated that they lacked information on which to base their recommendations.
35	3	MI	1987	USFWS/East Lansing ES Field Office	Military/small jet	Birds/raptors	In conjunction with a review of proposed military flights in the area, the East Lansing Office is in the process of reviewing bald eagle productivity data from a current jet flight path and comparing the data to State records for all of Michigan.

Appendix I. (Continued)

Item #	Region	State	Year	Agency/Location	Aircraft	Animal	Issue
36	3	OH	1987	USFWS/Ottawa NWR	Commercial/private/ small propeller/ helicopter	Birds/waterfowl	Fixed-wing planes flying less than 2,000 ft above ground level over the Refuge several times a year have caused waterfowl and geese to flush. After a straight line flight of a plane, the birds usually settle back to resting and feeding within 5 to 10 minutes. Repeated passes drive birds off the area for hours. Birds are more likely to leave the area completely when disturbed by helicopters; they appear to be more sensitive to the chopping sound from a much greater distance than the sound of a fixed-wing aircraft.
37	4	AL	1987	USFWS/Wheeler NWR	Military/private/ small propeller/ small jet/ helicopter	Birds/waterfowl	Frequent low-altitude aircraft overflights are causing waterfowl to leave the Refuge until the noise level returns to ambient.
38	4	AR	1987	USFWS/Holla Bend NWR	Private/small propeller/ helicopter	Birds/waterfowl	Various species of waterfowl, particularly geese, are flushing and leaving the Refuge in response to low-altitude aircraft overflights and do not return until the noise level returns to ambient.
39	4	AR	1987	USFWS/Wapanocca NWR	Private/small propeller/ helicopter	Birds/waterfowl	Various species of waterfowl, particularly geese, are flushing and leaving the Refuge in response to low-altitude aircraft overflights and do not return until the noise level returns to ambient.
40	4	FL	1987	USFWS/Jacksonville SE Field Office	Military/small jet	Birds/colonial nesting	A study of wading bird colonies in Florida indicated that low-altitude overflights by military subsonic fighter jets had little or no adverse effects on reproductive success.

Appendix I. (Continued)

Item #	Region	State	Year	Agency/Location	Aircraft	Animal	Issue
41	4	FL	1987	USFWS/Key West NWR	Commercial/small propeller	Birds/colonial nesting	It is believed that the only known United States colony of magnificent frigatebirds is suffering a population decline due to frequent low-altitude overflights by tour planes.
42	4	FL	1987	USFWS/Loxahatchee NWR	Commercial/private/small propeller/helicopter	Birds/waterfowl/shorebirds/other	Frequent overflights by low-altitude aircraft (some less than 100 ft above ground level) are causing numerous species of birds to flush and leave the area while the aircraft are present. The Refuge has complained to the FAA without results.
43	4	GA	1987	USFWS/Okefenokee NWR	Military/large jet	Birds/waterfowl	It is suspected that a proposed Air Force bombing range to be located immediately south of Banks Lake NWR will have an adverse effect on Refuge waterfowl.
44	4	LA	1987	USFWS/Catahoula NWR	Military/small jet	Birds/waterfowl	Frequent low-altitude military fighter jet overflights are causing waterfowl to flush and leave the area while the planes are in the vicinity.
45	4	LA	1987	USFWS/D'Arbonne NWR	Private/small propeller	Birds/waterfowl	Low-altitude aircraft are causing startle and flushing behavior in Refuge waterfowl.
46	4	NC	1987	USFWS/Asheville SE Field Office	Military/small jet/large jet/helicopter	Birds/cavity nesting/raptors	The Endangered Species Field Office was conducting Section 7 consultations for red-cockaded woodpeckers, eagles, and peregrine falcons in response to proposed low-altitude military aircraft overflights. They requested and received information (data base printout) on the effects of low-altitude aircraft on fish and wildlife.

Appendix I. (Continued)

Item #	Region	State	Year	Agency/Location	Aircraft	Animal	Issue
47	4	NC	1987	USFWS/Mackay Island NWR	Military/small jet/large jet/helicopter	Birds/waterfowl	Frequent low-altitude overflights are causing waterfowl to flush and leave the Refuge until the noise level returns to ambient.
48	4	NC	1987	USFWS/Mattamuskeet NWR	Military/large jet	Birds/waterfowl/shorebirds	Waterfowl and shorebirds are exhibiting startle and flushing behavior when low-altitude military bomber aircraft are in the vicinity.
49	4	NC	1987	USFWS/Pee Dee NWR	Military/small jet/helicopter	Birds/waterfowl	Frequent low-altitude overflights are causing waterfowl to flush and leave the Refuge until the noise level returns to ambient.
50	5	VA	1987	USFWS/ Back Bay NWR	Military/small jet/large jet/helicopter	Birds/waterfowl	Frequent low-altitude overflights are causing waterfowl to flush and leave the Refuge until the noise level returns to ambient.
51	5	DE	1987	USFWS/Bombay Hook NWR (2)	Military/commercial/private/small propeller/small jet/large jet/helicopter	Mammals/ungulates/birds/waterfowl/upland game/raptors/fish/shorebirds	Bombay Hook NWR is near Dover Air Force Base and receives heavy traffic by fighters, transports, helicopters, and other aircraft. Most commercial traffic is well above the Refuge (more than 10,000 ft). Sonic booms from military jets cause slight reactions (e.g., calling, alert) in pheasants and turkeys, some flushing of small birds, and startle and jumping reactions in fish. Helicopters appear to have a more pronounced impact on waterfowl and big game than repetitious plane overflights. Snow geese will invariably take flight well before a helicopter is visible or audible to a person. Raptors and game birds seem to watch aircraft much more than other terrestrial wildlife.

Appendix I. (Continued)

Item #	Region	State	Year	Agency/Location	Aircraft	Animal	Issue
52	5	NJ	1987	USFWS/Edwin B. Forsythe NWR	Commercial/ private/small propeller/small jet/helicopter	Birds/waterfowl	Low level helicopters associated with the casino industry in Atlantic City, New Jersey, are extremely effective at hazing snow geese and brant. The birds' response to helicopters is much greater than their response to planes. The birds' response begins when the helicopter is over a mile away and the birds do not settle down until several minutes after the helicopter has cleared the area. The Refuge is a primary wintering area for brant and a stopover for snow geese, and is under the most direct route to the large metropolitan areas in northern New Jersey.
53	5	VT	1987	USFWS/Missisquoi NWR	Private/small propeller	Birds/waterfowl	Migratory birds such as waterfowl are disturbed by low flying planes that in some instances may be a deliberate attempt to rally birds from unhunted areas toward hunters. The several miles of unpopulated beach and dunes also attract pilots that like to "barnstorm" areas, which has resulted in crash landings and human fatalities.
54	6	CO	1987	USFWS/Grand Junction SE Field Office	Commercial/ private/small jet/large jet/ helicopter	Birds/raptors	The Endangered Species Field Office is involved in a Section 7 consultation for the FAA in regard to the proposed new Denver airport. If built as proposed, the new airport will result in frequent overflights (within 500 ft) of a wintering bald eagle communal roost.

Appendix I. (Continued)

Item #	Region	State	Year	Agency/Location	Aircraft	Animal	Issue
55	6	MT	1987	USFWS/Helena SE Field Office	Military/small jet	Birds/raptors	The Endangered Species Office is sometimes called upon to do formal or informal consultation for endangered species in response to proposed low-altitude flying operations. They cited their lack of information on the effects of low-altitude aircraft on fish and wildlife. Of particular concern was information on eagles.
56	6	MT	1987	USFWS/Lee Metcalf NWR	Private/small propeller	Birds/raptors	It is believed that osprey in frequently overflown areas habituate to low-altitude aircraft. However, nesting osprey in seldom overflown areas do not appear to habituate and exhibit flight/fright behavior.
57	6	ND	1987	USFWS/Lostwood NWR	Military/small jet/helicopter	Birds/waterfowl	Low-altitude military aircraft are causing waterfowl to leave the Refuge. Waterfowl do not return to the Refuge until the aircraft leave the area.
58	6	NE	1987	USFWS/Crescent Lake NWR	Private/small propeller/small jet/large jet/helicopter	Mammals/ungulates/birds/upland game	It is believed that most low-altitude small aircraft have little effect on Refuge wildlife. Low-intensity sonic booms are causing fright/flight behavior in deer and pheasants.
59	6	SD	1987	USFWS/South Dakota ES Field Office	Commercial/private/small propeller	Mammals/ungulates/birds/waterfowl/other	Low-altitude aircraft are eliciting fright/flight reactions in deer, pronghorns, waterfowl, and other migratory birds. In some instances, animals will react almost as soon as the aircraft is discerned.

Appendix I. (Continued)

Item #	Region	State	Year	Agency/Location	Aircraft	Animal	Issue
60	7	AK	1987	USFWS/Anchorage ES Field Office	Military/small jet/large jet/helicopter	Mammals/ungulates/birds/seabirds	It is believed that low-altitude military aircraft are having an adverse effect on caribou, bighorn sheep, and cliff nesting birds. The Field Office is frequently called upon to comment on proposed low-altitude military aircraft operations but has no knowledge with which to adequately do so.
61	7	AK	1987	USFWS/Arctic NWR	Commercial/helicopter	Birds/waterfowl	Helicopter disturbance associated with oil development has caused flushing/fright behavior in tundra swans and snow geese. Tundra swans have abandoned nests because of the disturbance.
62	7	AK	1987	USFWS/Izembek NWR	Military/commercial	Birds/waterfowl	It is believed that low-altitude aircraft are having an adverse effect on waterfowl, particularly Pacific black brant.
63	7	AK	1987	USFWS/Selawik NWR	Military/commercial/small propeller/small jet	Birds/waterfowl/seabirds	A Corps of Engineers permit to construct an airstrip on St. Matthew Island was denied because of aircraft noise impact to adjacent seabird nesting cliffs. U.S. Air Force flight training near Lake Louise was objected to because of impact to calving caribou. Seabirds nesting 50 miles east of Nome had habituated to the frequent low overflights of commuter aircraft.
64	8	AL	1987	USFWS/Southeastern Fish Cultural Laboratory	Commercial/small jet	Fish	Intense, "focused" sonic booms resulted in the death of striped bass due to the fish jumping out of their tanks or dying of seizures in the water.

Appendix I. (Concluded)

Item #	Region	State	Year	Agency/Location	Aircraft	Animal	Issue
65	8	CA	1987	USFWS/Condor Research Center	Military/commercial/private/small propeller/small jet/large jet/helicopter	Birds/raptors	It is believed that aircraft noise and sonic booms to some degree helped lead to the demise of the California condor.
66	8	HI	1987	USFWS/Mauna Loa Research Station	Military/small jet/large jet	Birds/other	Low-altitude military overflights are believed to be causing the endangered palila bird to underutilize a sizeable portion of its critical habitat. A research study has been initiated.
67	8	MO	1987	USFWS/National Fishery Research Center	N/A	Fish	A study showed that mild simulated sonic boom had no effect on the survivability of salmonid fish eggs.
68	8	ND	1987	USFWS/Northern Prairie WRC	Military/private/small propeller/small jet/large jet/helicopter	Birds/colonial nesting	It is believed that low-altitude aircraft may be having an adverse effect on the reproduction and population of white pelicans at Chase Lake NWR in North Dakota.
69	8	TX	1987	USFWS/Patuxent WRC: Gulf Coast Field Station	Military/small jet/large jet/helicopter	Birds/upland game	A study at Ellington Air Force Base, Texas, revealed low-altitude aircraft had no adverse effects on Attwater's prairie chicken.